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Title

Injury surveillance of female adult Zumba® dancers

Abstract

BACKGROUND: We sought to describe the patterns of injury and to establish the injury incidence rates associated with Zumba®.

METHODS: Zumba® dancers were invited to complete an anonymous web-based survey containing 13 demographic background and 14 (1 yr retrospective) injury history questions. Inclusion criteria stated that the respondents had to be aged 18 – 64 yr and currently involved in group-based classes of Zumba®, either as a registered instructor or class participant. Binomial logistic regression analysis was used to predict the odds of injury during Zumba® and Mann-Whitney tests were employed to ascertain differences between groups.

RESULTS: The survey response rate was 74%. The final sample of respondents (N = 138; female = 100%) included 19 registered instructors and 119 class participants, of which 58% and 16%, respectively, sustained ≥ 1 injury during Zumba® in the past year. The odds of injury was 7 (95% CI 2 – 19) times greater ($p < 0.01$) for registered instructors than for class participants. Zumba® dancers had a 17 (95% CI 7 – 28) % greater ($p < 0.01$) odds of injury for every 1 h of non-Zumba®-related moderate to vigorous physical activity (MVPA) engagement per week. The injury incidence rate for registered instructors and class participants was 5.7 (95% CI 3.1 – 8.2) and 3.9 (95% CI 2.5 – 5.3) injuries per 1000 h of exposure, respectively.

CONCLUSIONS: Zumba® presents a low risk of injury; for registered instructors, the increased risk of injury is likely due to the high total volume of MVPA participated in weekly.

Key Words

Aerobic dance injuries–Dancer injury reduction–Latin dancing–Salsa aerobics–Zumba fitness

Introduction

Zumba® is a popular form of Latin-themed aerobic dance exercise participated in by an estimated 14 million people in over 150 countries.[1] In the context of physical activity promotion for health enhancement, randomized controlled trials have demonstrated the efficacy of Zumba® for the improvement of cardiorespiratory fitness,[2-4] body composition,[2, 4] body mass index (BMI),[2] inflammatory biomarkers relevant to cardiovascular health,[4] and psychological well-being.[3] Furthermore, Zumba® has been assessed using dance-specific objective monitoring techniques, in naturalistic environments, and with ecologically valid participant samples as being a vigorous (~6.47 metabolic equivalents) intensity form of exercise in female adults,[4, 5] of which the current recommendation for participation is 75 min per week.[6]

Currently, little empirical work has been published in the peer-reviewed literature in terms of the injury surveillance of Zumba® dancers. However, it has been reported that aerobic dance (in general) presents a low to moderate risk of time-loss injury, similar in nature to that of resistance training but lower than that of running.[7] Zumba® has also recently been evaluated for its potential association with increased low back pain in female adults.[8] In a search of the MEDLINE and CINAHL databases from 2000 up to and including June 2015, only a single surveillance study of injuries related specifically to Zumba® was found.[1] Indeed, this research provides some initial data to describe the prevalence of Zumba®-related injuries among Zumba® dancers; however, we would argue that this study was somewhat limited due to the small sample size used, the convenience sampling method of recruitment employed, and the fact that data concerning moderate to vigorous physical activity (MVPA) engagement outside of Zumba® were not collected. While it is acknowledged that comprehensive injury surveillance and risk assessment are necessary for guiding injury reduction efforts in dance,[9] fitness,[10] and amateur sport,[11] further investigation is needed specifically in aerobic dancers taking part in Zumba® for the purposes of health enhancement (both registered instructors and class participants) in order to better clarify the injury rates, patterns, severity, and risk factors associated with Zumba®.

In light of these points, the objectives of the current work were to i) establish the extent of injuries, ii) determine the odds of sustaining an injury, and iii) calculate the injury incidence rate during group-based classes of Zumba® in registered instructors and class participants using a 1 yr retrospective injury history survey.

Methods

Respondents

Zumba® dancers were invited to complete an anonymous web-based survey hosted on a secure web server (Bristol Online Surveys, University of Bristol, United Kingdom). Recruitment was undertaken using the web-based social networking services Facebook, Google+, and Twitter. Ethical approval for this study had been granted by the School of Science and Sport Ethics Committee at the University of the West of Scotland and informed consent, shown on the first page of the survey, was obtained prior to commencement. Inclusion criteria stated that the respondents had to be aged 18 – 64 yr and currently involved in group-based classes of Zumba®, either as a registered instructor or class participant. No specific exclusion criteria were stated in terms of minimum Zumba® experience, minimum Zumba® engagement per week, or health status. Of the 219 people who accessed the survey, 31 were screened out due to not meeting the inclusion criteria. The survey was attempted by 188 respondents, of whom 140 finished the questions. Male Zumba® dancers (n = 2) were excluded from the data analysis. The final sample therefore comprised 138 women.

Survey

The survey contained 13 demographic background and 14 injury history questions, all of which had to be answered in order to submit the completed responses. It was estimated (through pilot testing) that respondents would require 5 – 15 min to complete the survey. Age, stature, mass, and Zumba® experience were self-reported. BMI was calculated arithmetically. Respondents were asked how many Zumba® classes per month they took part in, on average, as well as the average duration in minutes of these classes. These data were used to compute Zumba® engagement per week. Respondents were asked the following question regarding MVPA, “Do you currently do any other forms of exercise or physical activity that are intense enough to raise your breathing rate (excluding housework or physical activity that may be a part of your job)?”. A positive response required reporting the average duration in minutes per week of these activities. The wording of this physical activity estimate was based on the single-item survey method validated by Milton *et al.*[12] Non-Zumba®-related MVPA engagement per week was determined from these data.

The injury history questions were asked retrospectively over a 1 yr period. This method has been demonstrated to have fair validity (accuracy = 61 – 100%) for the recall of injury history details in community sport.[13] Respondents were asked to recall the number, severity, type, location, and

associated risk factors of any Zumba®-related injuries they experienced. Injury was defined as any physical complaint sustained during group-based classes of Zumba®, irrespective of the need for medical attention or time-loss from Zumba® participation.[9] Injuries were further delineated into either physical complaint or time-loss injuries.[9] A physical complaint injury resulted in no days lost from being able to participate in Zumba®.[9] A time-loss injury was characterized as being either minor (1 – 7 days lost from being able to participate in Zumba®), moderate (8 – 28 days lost from being able to participate in Zumba®), or severe (≥ 29 days lost from being able to participate in Zumba®) in terms of severity.[9] Recurrent injury was defined as an injury with the same type and location as a previous injury occurring within the past two months; recurrent injuries were excluded from the data analysis.[9] Injury type was coded using the following seven exclusive categories[9]: bone (eg stress, fracture); bruise; cut (eg abrasion, blister); joint (non-bone) or ligament (eg dislocation, sprain); muscle or tendon (eg strain); nervous system (eg concussion); and other. Injury location was coded using the following 12 exclusive categories[9, 14]: ankle and foot; forearm and wrist; hand; head and neck; hip; knee; lower leg and Achilles tendon; lumbar and pelvis; shoulder; thorax; upper arm and elbow; and upper leg. Injury risk factors were coded using the following 15 non-exclusive categories[14, 15]: a result of other lifestyle activities; choreography was inadequately taught; choreography was too difficult; class was overcrowded; felt fatigued; ignored early warning signs of injury; inadequate environment; inadequately hydrated; inadequately warmed-up; inappropriate clothing; inappropriate footwear; intensity of the class was too high; other; psychological reasons; and too many repetitive movements. Injury incidence rate was calculated using the method of Knowles *et al.*[16]

Data Analysis

All statistical analyses were conducted using the programming language R (R 3.1.1, The R Foundation for Statistical Computing, Austria). Binomial logistic regression analysis with simultaneous fitting was used to predict the odds of injury. Mann-Whitney tests were employed to ascertain differences between groups. Centrality and spread are presented as median ($Q_1 – Q_3$) with 95% confidence intervals (CI) reported where appropriate. Alpha was set at 0.05. Initial logistic regression covariates (age, non-Zumba®-related MVPA engagement per week, registered instructor, and Zumba® experience) were selected based on previous aerobic dance exercise injury studies.[1, 7] An a priori sample size calculation was performed using the method of Peduzzi *et al.*[17] whereby an events per variable of 10 was chosen with the aforementioned four covariates and a predicted Zumba®

percentage injury rate of 29%.[1] This yielded a sample size of 138 respondents required for an unbiased logistic regression model; data collection was continued until this number was attained.

Results

Demographics

The survey response rate was 74%. The final sample of respondents (N = 138; female = 100%) included 19 registered instructors and 119 class participants of Zumba®, of which 100% and 72%, respectively, answered yes to the physical activity estimate question. No between-group differences (all $p > 0.05$) were revealed in measures of age, stature, mass, or BMI. Registered instructors, however, were more ($p < 0.001$) experienced in Zumba®, took part in more ($p < 0.001$) Zumba® class time weekly, and participated in a greater ($p < 0.05$) volume of weekly MVPA outside of Zumba® in comparison to class participants. Demographic background characteristics of the Zumba® dancers are presented in full in Table I.

Injuries

In the initial logistic regression model, age and Zumba® experience were found to be non-significant (both $p > 0.05$) covariates. These were therefore removed from the analysis. A second logistic regression model was fit with Zumba® engagement per week entered as a covariate. Similarly, Zumba® engagement per week was found to be non-significant ($p > 0.05$) and was also subsequently removed from the analysis. The final logistic regression model is presented in full in Table II. The odds of injury was 7 (95% CI 2 – 19) times greater ($p < 0.01$) for registered instructors than for class participants. Zumba® dancers had a 17 (95% CI 7 – 28) % greater ($p < 0.01$) odds of injury for every 1 h of non-Zumba®-related MVPA engagement per week. A significant ($p < 0.001$) likelihood ratio test and a non-significant ($p > 0.05$) Hosmer-Lemeshow test indicated the overall model evaluation was acceptable.

There were no differences (all $p > 0.05$) in age, stature, mass, BMI, or Zumba® engagement per week between injured and non-injured Zumba® dancers. Injured Zumba® dancers, however, had more ($p < 0.01$) Zumba® experience (3.8 (2.3 – 4.7) versus 1.6 (0.5 – 3.5) yr) and took part in a greater ($p < 0.001$) amount of non-Zumba®-related MVPA engagement per week (4.5 (3.0 – 6.5) versus 2.1 (0.0 – 4.0) h) in comparison to non-injured Zumba® dancers.

Fifty-eight percent of registered instructors and 16% of class participants sustained ≥ 1 injury during Zumba® in the past year. The average number of injuries for registered instructors and class

participants was 2 (1 – 2) and 1 (1 – 1), respectively. In total, 17 physical complaint and two time-loss injuries were reported by registered instructors. In class participants, a total of 21 physical complaint and three time-loss injuries were reported. Medical attention was required in only 5% of physical complaint injuries. None of the time-loss injuries required any medical attention. Eighty percent of time-loss injuries were minor in severity. The remaining 20% were characterized as severe. The most common type of injury was muscle or tendon (eg strain)-related; 58% and 60% of physical complaint and time-loss injuries, respectively, were of this nature. Injury types sustained during Zumba® are presented in full in Table III. The most common locations of injury for Zumba® dancers were the ankle and foot (35% of all injuries sustained) and the knee (33% of all injuries sustained). The highest rated risk factor attributed to injury in Zumba® dancers experiencing ≥ 1 injury during the past year was "a result of other lifestyle activities". Injury locations and risk factors are presented in full in Figures 1 and 2, respectively. The injury incidence rate for registered instructors and class participants was 5.7 (95% CI 3.1 – 8.2) and 3.9 (95% CI 2.5 – 5.3) injuries per 1000 h of exposure, respectively.

Discussion

This survey study has described female adult Zumba® dancers, both registered instructors and class participants, in terms of their demographic background and 1 yr retrospective injury history profile. Recruitment for and administration of the survey was entirely web-based. The injury incidence rate for group-based classes of Zumba® per 1000 h of exposure has not previously been published in the peer-reviewed literature. Another novel, and we feel important, aspect of the current work is that weekly participation time in Zumba® was found not to be a significant predictor of injury, whereas non-Zumba®-related MVPA engagement per week, in contrast, was.

The only other injury surveillance study of Zumba® dancers to date surveyed 49 class participants, of which 91% of the sample was female.[1] The average age, at 44 yr, was older than in this study. Results of the logistic regression analysis indicated, just as our own did, that neither age nor previous experience in the activity predicted injury risk during group-based classes of Zumba®. Rothenberger *et al.*,[18] in a survey study of aerobic dancers (*N* = 726; female = 84%; average age = 32 yr), albeit class participants of aerobic dance (in general), but not specifically Zumba® per se, similarly, demonstrated that injury risk was independent of previous experience in the activity. Furthermore, it was reported by Inouye *et al.*[1] that the odds of injury during group-based classes of Zumba® increased by 3.6 times for every one class participated in weekly. In the current work, however, Zumba®

engagement per week did not predict injury risk, although non-Zumba®-related MVPA engagement per week remained a significant covariate in the final logistic regression model. This discrepancy between the two investigations may be explained by Zumba® engagement and non-Zumba®-related MVPA engagement measures in our own investigation being related. Of note, Inouye *et al.*,[1] unfortunately, did not collect data concerning MVPA engagement outside of group-based classes of Zumba®.

The percentage injury rate during aerobic dance varies depending on instructor status. For Zumba®, 29% of class participants reported sustaining an injury during group-based classes of the activity.[1] In the current work, the figure for class participants was lower, at 16%, for combined physical complaint and time-loss injuries. Although it is unclear why these results differ, we would argue that a direct comparison may be difficult to make[9, 19] as the authors of the aforementioned work neither provided a specific definition for the term "injury" nor specified an exact time period for the retrospective reporting of injuries. In another study (N = 411; female = 86%; average age = 32 yr) of aerobic dancers (in general), but again not specifically Zumba® dancers per se, Garrick *et al.*[20] reported a higher figure of 44% for class participants who had sustained an injury. In registered instructors of Zumba®, our own results indicated a percentage injury rate of 58%. This is lower than both the 75% described by Garrick *et al.*[20] for aerobic dance instructors and a similar finding of 77% reported by du Toit and Smith (N = 70; female = 80%; average age = 29 yr),[21] who too surveyed instructors of aerobic dance (in general), but not specifically Zumba® per se. In a recent epidemiological report of 2238 hospital admission and emergency department fitness-related injury cases, aerobic dance injuries were reported to have comprised the smallest proportion (11%) of total cases.[10] Injuries resulting from resistance training and motorized or general gym equipment use made up 37% and 52% of the remaining cases, respectively.

As the injury incidence rate for Zumba® has been calculated in the current work, it is now possible to make comparisons using this metric with other forms of fitness/exercise. In a systematic review and meta-analysis that included studies comprising 946 recreational runners,[22] the injury incidence rate was reported to be 7.7 injuries per 1000 h of exposure. This figure is substantially higher than what was observed in our class participants of Zumba® (3.9 injuries per 1000 h of exposure). The use of low impact gym equipment, however, has been reported to be less injurious than Zumba®. Requa *et al.* (N = 986; female = 58%; average age = 32 yr)[23] demonstrated that stationary bikes and stair climbers resulted in 1.8 and 3.0 injuries per 1000 h of exposure,

respectively. In the same study, in contrast, resistance training was shown to be more injurious than class participation in Zumba®; free weights and weight machines were associated with an injury incidence rate of 4.8 and 5.8 injuries per 1000 h of exposure, respectively. Also in the same study, treadmill running was reported to result in 6.8 injuries per 1000 h of exposure, a figure which is higher than that of class participation in Zumba®, but less than that of outdoor running for recreational purposes.[22]

In the current work, the ankle and foot, at 35% of total injuries, the knee, at 33% of total injuries, and the lower leg and Achilles tendon, at 14% of total injuries were the three most frequently injured locations for combined physical complaint and time-loss injuries. These figures are similar to those previously presented, where the knee, ankle and foot, and shoulder, at 42%, 14%, and 14% of total injuries, respectively, were reported as the most frequent locations of injury during group-based classes of Zumba®.[1] For aerobic dance (in general), comparable findings have been reported by Garrick *et al.*,[20] where the shin and leg, foot, and knee comprised 29%, 23%, and 15% of total injuries, respectively. These results are also not dissimilar to those presented by Rothenberger *et al.*[18] Hence, the evidence suggests that aerobic dancers are injured much more frequently in the lower than the upper body, which is not surprising given the high lower body impact nature of the activity.[24] In contrast, injuries during resistance training have been more frequently reported in the shoulder and low back when compared to the lower body.[25]

Although this investigation is the first research we are aware of to have described the patterns of injury and to have established the injury incidence rates associated with Zumba® in a sample of both registered instructors and class participants, there are certain limitations of our study that must be recognized. Firstly, the survey questions were answered retrospectively, and secondly, they were self-reported. A proposal by Bronner *et al.*[9] suggested that dance injury surveillance ought to be conducted in a prospective fashion and with injury incidents recorded by medical personnel, thus eliminating potential recall bias and likely improving the accuracy of injury coding.

To summarize, for Zumba® dancers taking part in the activity for the purposes of health enhancement, the odds of injury was shown to be higher in registered instructors than in class participants. Furthermore, those who engaged in a greater amount of non-Zumba®-related MVPA weekly had a higher odds of injury than those who took part less frequently. The injury incidence rate for registered instructors and class participants of Zumba® was shown to be 5.7 and 3.9 injuries per

1000 h of exposure, respectively. These results indicate that the likelihood of sustaining an injury during Zumba® is less than in resistance training and running, for example.

In conclusion, we propose that participation in group-based classes of Zumba® presents a low risk of injury in female adults. However, although many people around the world participate in Zumba®, there is currently little research to suggest exactly how injurious, or not, the activity is in comparison with other popular fitness activities. The current work adds new information about Zumba® in terms of the injury risk for both registered instructors and class participants. Our data indicate that instructor status and amount of MVPA engaged in outside of Zumba® are the best predictors of injury during group-based classes of the activity. Therefore, as with other forms of aerobic activity, it is likely that ensuring an adequate warm-up and cool-down are performed, appropriate progression of intensity is followed, adequate hydration is maintained, and signs of fatigue are not ignored might contribute to less injuries sustained during Zumba® classes. Furthermore, if Zumba® dancers are engaging in additional MVPA, cross-training with different modalities of exercise (eg non-aerobic dance-related activities) might also be beneficial for reducing the risk of injury.

References

1. Inouye J, Nichols A, Maskarinec G, Tseng CW. A survey of musculoskeletal injuries associated with Zumba. Hawaii J Med Public Health 2013;72:433–6.

2. Barene S, Krustrup P, Brekke OL, Holtermann A. Soccer and Zumba as health-promoting activities among female hospital employees: a 40-weeks cluster randomised intervention study. J Sports Sci 2014;32:1539–49.

3. Delextrat AA, Warner S, Graham S, Neupert E. An 8-week exercise intervention based on Zumba® improves aerobic fitness and psychological well-being in healthy women. J Phys Act Health 2016;13:131–9.

4. Domene PA, Moir HJ, Pummell E, Knox A, Easton C. The health-enhancing efficacy of Zumba® fitness: an 8-week randomised controlled study. J Sports Sci 2016;34:1396–1404.

5. Domene PA, Moir HJ, Pummell E, Easton C. Salsa dance and Zumba fitness: acute responses during community-based classes. J Sport Health Sci 2016;5:190–6.

6. Garber CE, Blissmer B, Deschenes MR, Franklin BA, Lamonte MJ, Lee IM *et al.* American College of Sports Medicine position stand. Quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromotor fitness in apparently healthy adults: guidance for prescribing exercise. Med Sci Sports Exerc 2011;43:1334–59.

7. Scharff-Olson MR, Williford HN, Brown JA. Injuries associated with current dance-exercise practices. J Dance Med Sci 1999;3:144–50.

8. Notarnicola A, Maccagnano G, Pesce V, Tafuri S, Leo N, Moretti B. Is the Zumba fitness responsible for low back pain? Musculoskelet Surg 2015;99:211–6.

9. Bronner S, Ojofeitimi S, Mayers L. Comprehensive surveillance of dance injuries. A proposal for uniform reporting guidelines for professional companies. J Dance Med Sci 2006;10:69–80.

10. Gray SE, Finch CF. Epidemiology of hospital-treated injuries sustained by fitness participants. Res Q Exerc Sport 2015;86:81–7.

11. Aman M, Forssblad M, Henriksson-Larsen K. Insurance claims data: a possible solution for a national sports injury surveillance system? An evaluation of data information against ASIDD and consensus statements on sports injury surveillance. BMJ Open 2014;4:e005056.

12. Milton K, Bull FC, Bauman A. Reliability and validity testing of a single-item physical activity measure. Br J Sports Med 2011;45:203–8.

13. Gabbe BJ, Finch CF, Bennell KL, Wajswelner H. How valid is a self reported 12 month sports injury history? Br J Sports Med 2003;37:545–7.

14. Ojofeitimi S, Bronner S, Woo H. Injury incidence in hip hop. Scand J Med Sci Sports 2012;22:347–55.

15. Riding McCabe T, Ambegaonkar JP, Redding E, Wyon M. Fit to dance survey: a comparison with dancesport injuries. Med Probl Perform Art 2014;29:102–10.

16. Knowles SB, Marshall SW, Guskiewicz KM. Issues in estimating risks and rates in sports injury research. J Athl Train 2006;41:207–15.

17. Peduzzi P, Concato J, Kemper E, Holford TR, Feinstein AR. A simulation study of the number of events per variable in logistic regression analysis. J Clin Epidemiol 1996;9:1373–9.

18. Rothenberger LA, Chang JI, Cable TA. Prevalence and types of injuries in aerobic dancers. Am J Sports Med 1988;16:403–7.

19. Russell JA. Preventing dance injuries: current perspectives. Open Access J Sports Med 2013;4:199–210.

20. Garrick JG, Gillien DM, Whiteside P. The epidemiology of aerobic dance injuries. Am J Sports Med 1986;14:67–72.

21. du Toit V, Smith R. Survey of the effects of aerobic dance on the lower extremity in aerobic instructors. J Am Podiatr Med Assoc 2001;91:528–32.

22. Videbaek S, Bueno AM, Nielson RO, Rasmussen S. Incidence of running-related injuries per 1000 h of running in different types of runners: a systematic review and meta-analysis. Sports Med 2015;45:1017–26.

23. Requa RK, DeAvilla LN, Garrick JG. Injuries in recreational adult fitness activities. Am J Sports Med 1993;21:461–7.

24. Rousanoglou EN, Boudolos KD. Ground reaction forces and heart rate profile of aerobic dance instructors during a low and high impact exercise programme. J Sports Med Phys Fitness 2005;45:162–70.

25. Butragueno J, Benito PJ, Maffulli N. Injuries in strength training: review and practical application. Eur J Hum Mov 2014;32:29–47.

Tables

TABLE I.—*Demographic background characteristics of female adult Zumba® dancers.*

	Total	Registered instructors (*n* = 19)	Class participants (*n* = 119)	*p*
Age (yr)	36 (26 – 44)	40 (35 – 43)	35 (25 – 46)	0.19
Stature (cm)	163 (157 – 166)	163 (157 – 166)	163 (157 – 166)	0.76
Mass (kg)	66 (60 – 73)	63 (58 – 74)	66 (60 – 73)	0.61
BMI (kg/m^2)	24.8 (22.3 – 28.3)	23.8 (22.5 – 29.3)	24.9 (22.3 – 27.9)	0.98
Zumba® experience (yr)	2.0 (0.8 – 3.8)*	4.5 (3.8 – 4.8)	1.6 (0.5 – 3.0)	< 0.001
Zumba® engagement per week (h)	0.9 (0.7 – 1.4)*	4.0 (1.9 – 4.6)	0.9 (0.6 – 1.4)	< 0.001
Non-Zumba®-related MVPA engagement per week (h)	3.0 (0.8 – 5.0)*	4.0 (2.6 – 6.0)	3.0 (0.0 – 4.5)	< 0.05

Data are presented as median (Q_1 – Q_3).
BMI: body mass index; MVPA: moderate to vigorous physical activity.
* significant difference between groups (Mann-Whitney test).

Table II.—*Binomial logistic regression analysis† used for prediction of the odds of injury during group-based classes of Zumba® in registered instructors (n = 19) and class participants (n = 119).*

	β	SE	χ^2	df	*p*	OR	95% CI
Constant	–2.52	0.38	44.27	1	< 0.001		
Registered instructor (yes/no)	1.89	0.55	11.68	1	< 0.01	6.60	2.24 – 19.48
Non-Zumba®-related MVPA engagement per week (h)	0.16	0.05	10.87	1	< 0.01	1.17	1.07 – 1.28

CI: confidence interval; MVPA: moderate to vigorous physical activity; OR: odds ratio; SE: standard error.
† classification table accuracy = 82%.

Table III.—*Types of injuries sustained during group-based classes of Zumba® by registered instructors (n = 19) and class participants (n = 119).*

	Physical complaint injury†	Time-loss injury‡
Muscle or tendon (eg strain)		
Number	22	3
Percent (%)	58	60
Joint (non-bone) or ligament (eg dislocation, sprain)		
Number	15	1
Percent (%)	39	20
Bruise		
Number	1	1
Percent (%)	3	20
Bone (eg stress, fracture)		
Number	0	0
Percent (%)	0	0
Cut (eg abrasion, blister)		
Number	0	0
Percent (%)	0	0
Nervous system (eg concussion)		
Number	0	0
Percent (%)	0	0
Other		
Number	0	0
Percent (%)	0	0

† no days lost from being able to participate in Zumba®.
‡ ≥ 1 day lost from being able to participate in Zumba®.

Figure Captions

Figure 1.—Locations of injuries sustained during group-based classes of Zumba® by registered instructors (*n* = 19) and class participants (*n* = 119).

Figure 2.—Risk factors attributed to injuries sustained during group-based classes of Zumba® by registered instructors (*n* = 19) and class participants (*n* = 119) experiencing ≥ 1 injury during the past year.

Figure 1

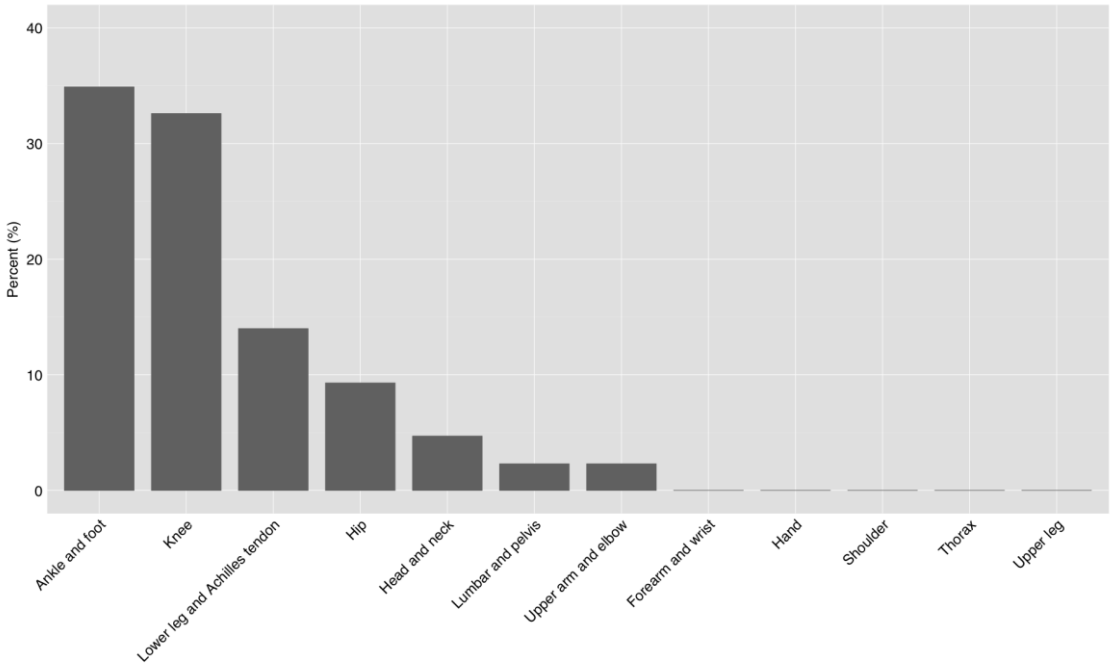
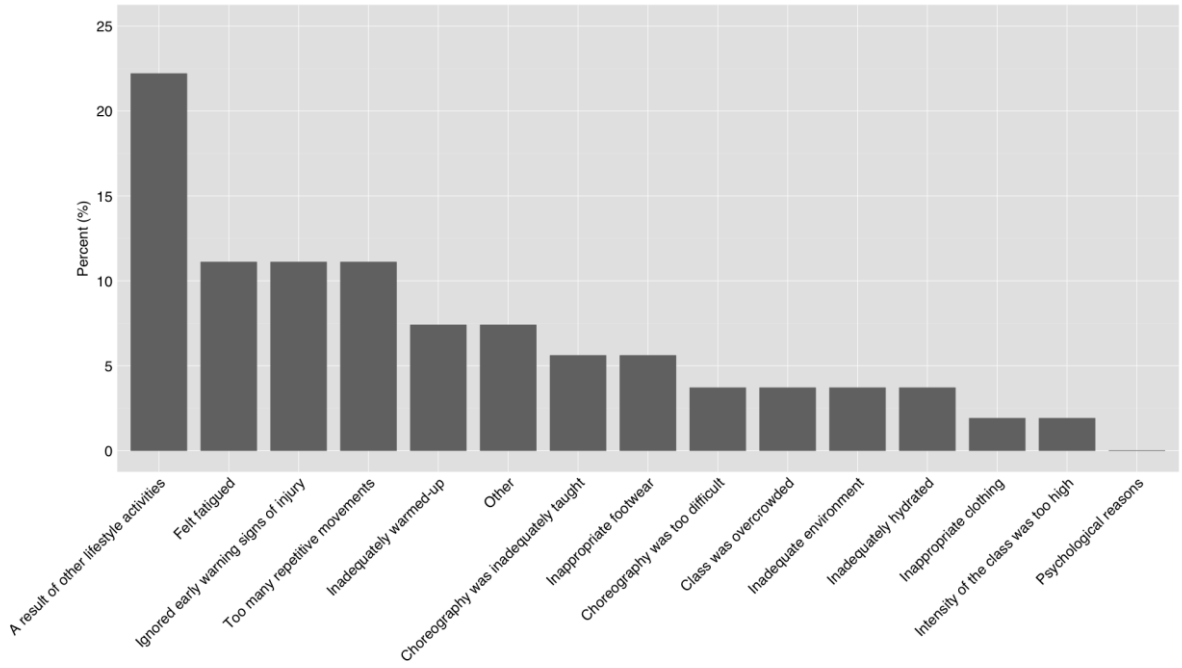

40
30
20
10
0
Percent (%)
Ankle and foot
Knee
Lower leg and Achilles tendon
Hip
Head and neck
Lumbar and pelvis
Upper arm and elbow
Forearm and wrist
Hand
Shoulder
Thorax
Upper leg

Figure 2


Percent (%)
25
20
15
10
5
0
A result of other lifestyle activities
Felt fatigued
Ignored early warning signs of injury
Too many repetitive movements
Inadequately warmed-up
Other
Choreography was inadequately taught
Inappropriate footwear
Choreography was too difficult
Class was overcrowded
Inadequate environment
Inadequately hydrated
Inappropriate clothing
Intensity of the class was too high
Psychological reasons